International Journal of Computer Networking, Wireless and Mobile Communications (IJCNWMC)
ISSN(P): 2250-1568; ISSN(E): 2278-9448
Vol. 3, Issue 5, Dec 2013, 63-70

ANALYSIS OF LOCATION BASED QUERIES IN MOBILE ENVIRONMENTS WITH PRIVACY CONSIDERATIONS

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ABSTRACT

In location-based services, users with location-aware mobile devices are able to make queries about their surroundings anywhere and at any time. To efficiently compute the location based queries which are found in any uncertain range in the entire region, and provide much more possible solutions related to that queries until the requestor gets satisfied.In many applications, including location based services, queries may not be precise. In this paper, we study the problem of efficiently computing range aggregates in a multidimensional space when the query location is uncertain. Specifically, for a query point Q whose location is uncertain and a set S of points in a multi-dimensional space.

The implementation of Location based query optimization requires two cloaking algorithms, namely MaxAccu Cloak and MinComm Cloak, are designed based on different performance objectives. Finally, this system develops an efficient polynomial algorithm for evaluating circular region-based queries.

This system requires efficient techniques to solve the problem following the *filtering-and-verification* paradigm. In particular, two novel filtering techniques are proposed to effectively and efficiently remove data points from verification. Our comprehensive experiments based on both real and synthetic data demonstrate the efficiency and scalability of our techniques. Moreover, the progressive query processing mode achieves a shorter response time than the bulk mode by parallelizing the query evaluation and result transmission based on data mining analysis.

KEYWORDS: Location Dependent Query, Semantic Cache, Nearest Neighbor Searching, Scheduling

INTRODUCTION

The term Location-Based Services *(*LBS*)* is a recent concept that denotes applications integrating with the general notion of services. Examples of such applications include emergency services, car navigation systems, tourist tour planning, or information delivery. In the modern environment each and every users has lots and lots of queries to analyze the locations in a global place, in that case the main motivity of server is to successfully serve the response to all the requestor without any delay as well as maintain the privacy of individuals. The basic idea of every server is the concept of load balancing; here the server requires reducing the number of queries submitted by mobile clients and query load on the server. However, mobile clients suffer from longer waiting time for the server to compute valid regions.

In this system the location based services demonstrates, a proxy-based approach to continuous nearest-neighbor (NN) and window queries. The proxy creates estimated valid regions (EVRs) for mobile clients by exploiting spatial and temporal locality of spatial queries.

For NN queries, we devise two new algorithms to accelerate EVR growth, leading the proxy to build effective EVRs even when the cache size is small. On the other hand, the system is to represent the EVRs of window queries in the form of vectors, called estimated window vectors (EWVs), to achieve larger estimated valid regions.

This novel representation and the associated creation algorithm result in more effective EVRs of window queries. In addition, due to the distinct characteristics, we use separate index structures, namely EVR-tree and grid index, for NN queries and window queries, respectively. To further increase efficiency, we develop algorithms to exploit the results of NN queries to aid grid index growth, benefiting EWV creation of window queries. Similarly, the grid index is utilized to support NN query answering and EVR updating. We conduct several experiments for performance evaluation. The experimental results show that the proposed approach significantly outperforms the existing proxy-based approaches. With the development of mobile communication, these applications represent a novel challenge both conceptually and technically. Clearly, most such applications will be part of everyday life tomorrow, running on computers, personal digital assistants (PDAs), phones, and so on. Providing users with added value to mere location information is a complex task.

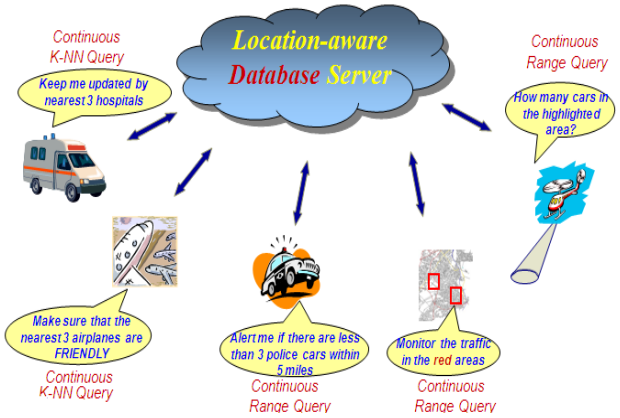

Figure 1

Given the variety of possible applications, the basic requirements of LBS are numerous. Among them we can cite the existence of standards, efficient computing power, and friendly yet powerful human–computer interfaces.

Many studies have shown that consumers care about their privacy and are wary of any intrusions. As a result, operators and marketers, but also friends among each other, must be careful and sensitive about the way they handle the localization of others. In addition to the perception of being observed, spamming has become another threat to the industry. Because location would considerably enhance the relevancy of messages, location-based messages may occur and considerably intrude on people's "right to be let alone." As a result of the relatively free distribution of mobile phone numbers, it is feared that a similar spamming problem could emerge in the mobile world as can be observed today on the Internet.

Unsolicited messages pushed to mobile phones may be perceived as even more harmful by the recipients than email spamming.Spatial range queries and k-nearest-neighbor queries are two types of the most commonly used queries in LBS.

For example, a user can make a range query to find out all shopping centers within a certain distance of her current location, or make a query to find out the k nearest gas stations. In these queries, the user has to provide the LBS server with her current location. But the disclosure of location information to the server raises privacy concerns, which have hampered the widespread use of LBS. Location cloaking, is one typical approach to protecting user location privacy in LBS. Upon receiving a location-based spatial query (e.g., a range query or a query) from the user, the system cloaks the user’s current location into a cloaking region based on the user’s privacy requirement.

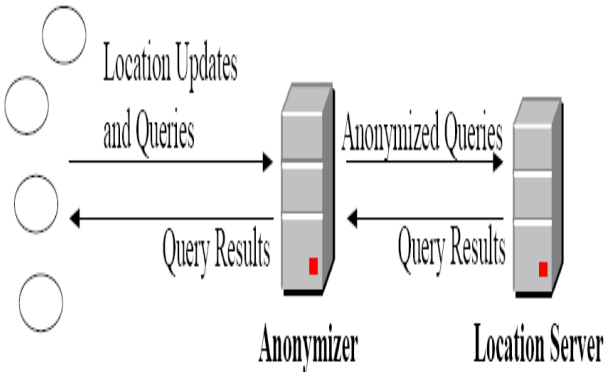

Figure 2

The location-based spatial query is thus transformed into a region-based spatial query before being sent to the LBS server. The LBS server then evaluates the region-based query and returns a result superset, which contains the query results for all possible location points in the cloaking region. Finally, the system refines the result superset to generate the exact results for the query location.We find that, given privacy requirement, representing the cloaking region with a circle generally leads to a smaller result superset than using other shapes.Second, we consider the location cloaking problem for continuous LBS queries.

In such scenarios, trace analysis attacks are possible by linking historical cloaking regions with user mobility patterns.The server is then able to infer that the user must be located in the intersection area, which degrades the quality of location cloaking and may fail to meet the expected privacy requirement. Finally, we investigate how to evaluate efficiently circular region- based spatial queries on the LBS server. While the evaluation of circular-region-based range queries is straightforward, we develop an efficient O (kM3) algorithm for evaluating circular-region-based queries, where M is the cardinality of the spatial object set. In addition, we present two query processing modes, namely bulk and progressive, which return query results either all at once or in an incremental manner.

EXISTING SYSTEM

The existing techniques for processing location based spatial queries regarding certain query points and data points are not applicable or inefficient when uncertain queries are involved. And also the mobile host cannot tolerate the misbehavior of intruders as well. Once the query raised the normal host expects how to request the query with private manner, but the medium is public so the server satisfy the requests one by one. Lots of time is consumed for single query processing, and responses are really slow in progress. For processing in this kind requires lots of bandwidth capabilities and this process is difficult to identify and prevent attackers as well as hard to maintain the privacy.

PROPOSED SYSTEM

Our techniques will be presented based on the combinedcount. Nevertheless, they can be immediately extended to cover other aggregates, such as min, max, sum, avg, etc. In this application, the risk of civilian casualties may be measured by the total number n of civilian objects which are within γ distance away from a possible blast point with at least θ probability. It is important to avoid the civilian casualties by estimating the likelihood of damaging civilian objects once the aiming point of a distance (km) is determined.

The proposed system ultimately cares about the issues of privacy and its existing tolerance. First of all it handles the server with some specialized mechanisms called filtering and Verification, with the help of filtering algorithm the server can easily filter out the process of extracting the response of the queries, and verification algorithm illustrates the

process of identifying the queries raised from the mobile host is already raised by another mobile host or not, if the query was already processed then the server redirects the requesting mobile host to another mobile host of which one already get satisfied with server. But the Communication between those two mobile hosts are illustrated by server only, after getting response from the mobile host the destination mobile host cannot interact with the other without the knowledge of the server.

RELATED WORK

Literature survey is the most important step in software development process. Before developing the tool it is necessary to determine the time factor, economy and company strength. Once these things are satisfied, then the next step is to determine which operating system and language can be used for developing the tool. Once the programmers start building the tool the programmers need lot of external support. This support can be obtained from senior programmers, from book or from websites. Before building the system the above consideration are taken into account for developing the proposed system.

The major part of the project development sector considers and fully survey all the required needs for developing the project. For every project Literature survey is the most important sector in software development process. Before developing the tools and the associated designing it is necessary to determine and survey the time factor, resource requirement, man power, economy, and company strength. Once these things are satisfied and fully surveyed, then the next step is to determine about the software specifications in the respective system such as what type of operating system the project would require, and what are all the necessary software are needed to proceed with the next step such as developing the tools, and the associated operations.

SPATIAL QUERY PROCESSING

A large body of research has investigated spatial query processing, in particular kNN search. Most kNN search algorithms have focused on disk access methods based on R-tree-like index structures. The branch-and-bound approach is often employed in query evaluation to traverse the index and prune search space. Various query evaluation algorithms differ in terms of the visiting order of index nodes and the metric used to prune search space, whereas the previous studies investigated the kNN problem for a location point or a line segment only, our recent work has developed an evaluation strategy for rectangular region- based kNN queries that retrieve the k-nearest neighbors of all possible location points in a rectangular region. We remark that the strategy developed in is based on the fact that a rectangle can be decomposed into a set of straight line segments.

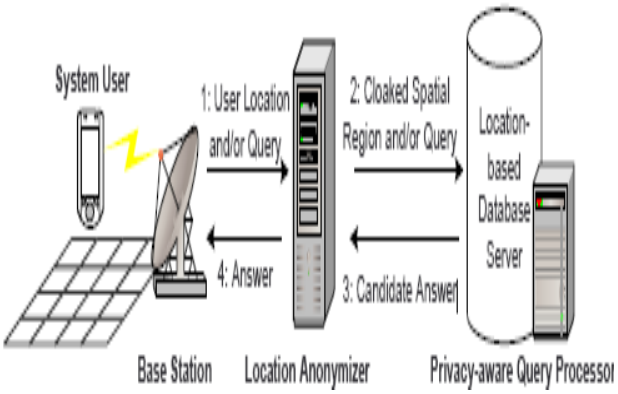

Figure 3

But because such decomposition is infeasible for a circle, the strategy of cannot be extended to evaluate circular-region-based kNN queries. In another related work, Cheng et al. developed algorithms for evaluating probabilistic queries over imprecise object locations. In contrast, we are interested in using imprecise locations to retrieve result supersets for region-based spatial queries.

SPATIAL CLOACKING

Spatial cloaking is a technique to shape a user's exact location into a spatial region in order to preserve her location privacy. The blurred spatial region must satisfy the user's specified privacy requirement. The most widely used privacy requirements are k-anonymity and minimum spatial area. The k-anonymity requirement guarantees that a user location is indistinguishable among k users. On the other hand, the minimum spatial area requirement guarantees that a user's exact location must be blurred into a spatial region with an area of at least, such that the probability of the user being located in any point within the spatial region.

Filtering-and-Verification Algorithm

This motivates us to follow the *filtering-and-verification* paradigm for the uncertain aggregate query computation. Particularly, in the *filtering phase*, effective and efficient filtering techniques will be applied to *prune (trim)* or *validate* the points. The algorithm consists of two phases. In the *filtering* phase for each entry is to be processed, we do not need to further process if it is *pruned* or *validated* by the filter. We say an entry e is *pruned* (*validated*) if the filter can claim for any point within the range. The counter is increased by the entry if the entry is *validated* where the entry denotes the aggregate value of e (i.e., the number of data points in e). Otherwise, the point p associated with e is a candidate point if e corresponds to a data entry and all child entries of e are put into the queue for further processing if e is an intermediate entry. The *filtering phase* terminates when the queue is empty. In the *verification* phase candidate points are *verified* by the integral calculations.

NAIVE ALGORITHM

A Naive algorithm is usually the most obvious solution when one is asked a problem. It may not be a smart algorithm but will probably get the job done. (Eg. Trying to search for an element in a sorted array.)

The naive method answering continuous spatial queries is to submit a new query whenever the query location changes. The naive method is able to provide correct results, but it poses the following problems:

High Power Consumption

The power consumption of a mobile device is high since the mobile device keeps submitting queries to the LBS server.

Heavy Server Load

A continuous query usually consists of a number of queries to the LBS server, thereby increasing the load on the LBS server.

Novel Representation Algorithm

A novel representation algorithm, using microarray expression profiles, specifically designed to scale up to the complexity of regulatory networks in network cells, yet general enough to address a wider range of network problems.

This method uses an information theoretic approach to eliminate the vast majority of indirect interactions typically inferred by pair wise analysis.

Associated Creation Algorithm

An associated creation algorithm describes the concept of finding the nearest mobile host or the mobile host connected with the server, and which one gets satisfied for the request, and which one is in pending for getting response.

SYSTEM ARCHITECTURE

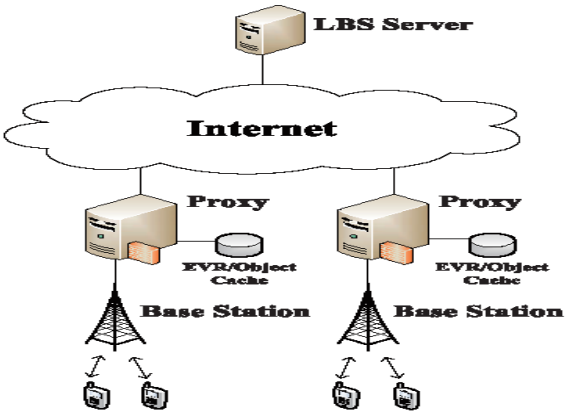

Figure 4

CONCLUSIONS

In this paper, we have proposed a proxy-based approach to continuous NN and window queries in mobile environments.The proxy takes advantage of spatial and temporallocality of spatial queries to create EVRs of NN and windowqueries. Different from prior work, we devised new EVRcreation and extension algorithms for NN queries, enablingthe proxy to build effective EVRs efficiently. The devisedalgorithms make the proxy achieve high performance evenwhen the cache size is small. On the other hand, we proposeto represent EVRs of window queries in the form of vectorscalled estimated window vectors, to achieve larger estimatedvalid regions. Moreover, due to distinct characteristics,we introduce an EVR-tree and a grid index to processNN and window queries, respectively. The algorithms formutual support of the EVR-tree and the grid index aredeveloped to further enhance the system performance. Theexperimental results show that the proposed approachsignificantly outperforms the existing proxy-based approachessince our proposed algorithms create much largerEVRs for mobile clients.Compared with the representative server-based approach,the experimental results indicate that the proposedproxy-based approach achieves similar performance eventhough the proxy has only partial information of dataobjects. Besides, the results reveal that the proposed proxybasedapproach is suitable in a densely populated area,whereas the server-based approach is suitable when mobileclients move at high speeds. Although offering the abovebenefits, the inherent problem of data object updates needsfurther investigation for the proposed proxy-based approach.In future work, we will investigate the impact ofdata object updates on the proposed approach and extendthe proposed approach to efficiently handle frequent object

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